

# Development of Diamond Vacuum Differential Amplifier for Harsh Environment Power Electronics, Phase II

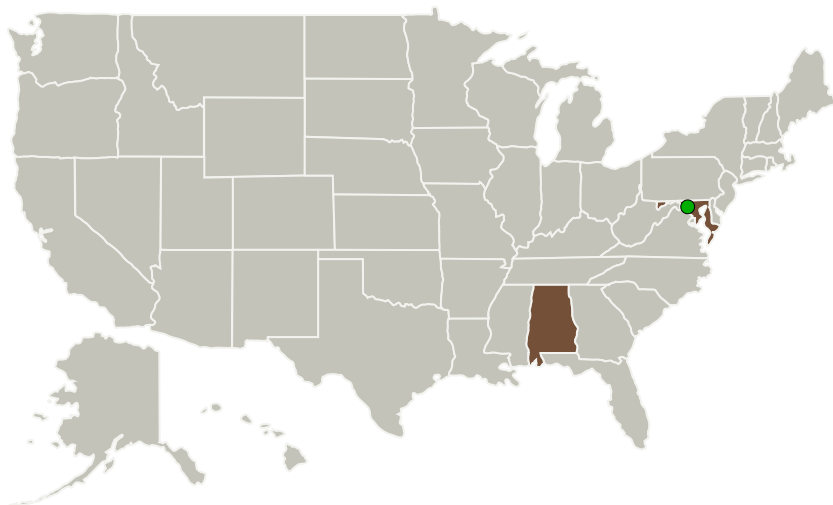
Completed Technology Project (2017 - 2019)



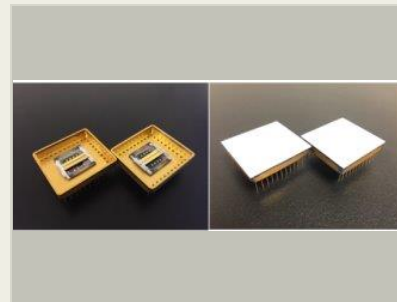
## Project Introduction

In this proposed Phase II, Scientific and Vanderbilt University will develop a novel vacuum field emission differential amplifier (VFEDA) using low electron affinity nanodiamond (ND) material as electron emitters for high-power electronic application in harsh environments. The ND-VFEDA is a fundamental circuit building block for vacuum integrated circuits (VICs) ideally suited for high radiation and space applications. The proposed high-power ND-VFEDA will be capable of operating over a wide-temperature range ( $-125^{\circ}\text{C}$  to  $450^{\circ}\text{C}$ ), possess tolerance to extreme doses of ionizing radiation and deliver the long-term reliability and stability needed to successfully execute environmentally stressful space science missions.

## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Scientific, Inc.	Lead Organization	Industry	Huntsville, Alabama
 Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland



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## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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## Primary U.S. Work Locations

Alabama

Maryland

## Project Transitions

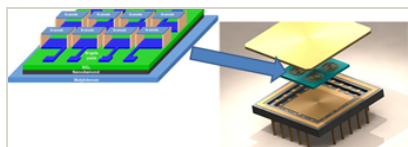
**April 2017:** Project Start

**April 2019:** Closed out

### Closeout Documentation:

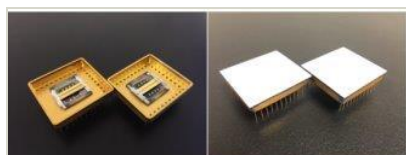
- Final Summary Chart(<https://techport.nasa.gov/file/140842>)

## Images



### Briefing Chart Image

Development of Diamond Vacuum Differential Amplifier for Harsh Environment Power Electronics, Phase II Briefing Chart Image (<https://techport.nasa.gov/image/128775>)



### Final Summary Chart Image

Development of Diamond Vacuum Differential Amplifier for Harsh Environment Power Electronics, Phase II (<https://techport.nasa.gov/image/133461>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Scientific, Inc.

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

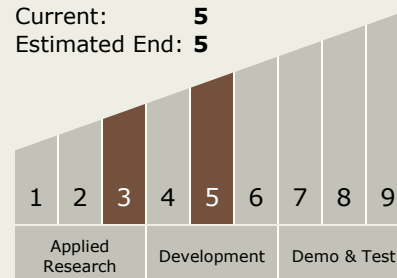
Carlos Torrez

### Principal Investigator:

Steven Renfrow

## Technology Maturity (TRL)

Start: 3  
Current: 5  
Estimated End: 5



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## Technology Areas

### Primary:

- TX03 Aerospace Power and Energy Storage
  - └ TX03.3 Power Management and Distribution
    - └ TX03.3.4 Advanced Electronic Parts

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System